



**NHTSA Model Specifications for Breath Alcohol Ignition
Interlock Devices (BAIIDs)**
ADS Comments on 1992 vs. 2013 Specification 10/24/2015

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NHTSA-2013-0058 Summary: This notice revises the Model Specifications for Breath Alcohol Ignition Interlock Devices (BAIIDs). The Model Specifications are guidelines for the performance and uniform testing of BAIIDs. These devices are designed to prevent a driver from starting a motor vehicle when the driver's breath alcohol concentration (BrAC) is at or above a set alcohol level. Every State in the United States has enacted a law providing for the use of BAIIDs as a sanction for drivers convicted of driving while intoxicated offenses. Since the Model Specifications were adopted in 1992, many States have incorporated them or some variation into their certification requirements. This notice revises the 1992 Model Specifications, to test BAIIDs for conformance.

ADS has tested and certified their "Determinator" BAIID under both the 1992 and 2013 NHTSA specifications. Below is a comparison of the 1992 to 2013 specification including the specific differences and potential improvements for user operation and device accuracy.

1) Precision and Accuracy

New alcohol limits are slightly relaxed at room temperature and 25% tighter under non-standard environmental conditions. Example: one alcohol limit was dropped from 0.040 to 0.032 BrAC. The passing grade has changed from 90% to 95%.

1992: If alcohol setpoint is 0.02, tested alcohol at 0.00, 0.01, 0.03, 0.04, 0.05, and 0.10 BrAC. Unstressed tests are typically at room temperature / 11 VDC. Stressed tests and requirements are typically at 16 VDC or low/high temperatures.

- 0.00 (stressed) 20 trials. Permit start 18 out of 20 (90%)
- 0.01 (unstressed) 20 trials. Permit start 18 out of 20
- 0.03 (unstressed) 20 trials. Prevent start 18 out of 20
- 0.04 (stressed) 20 trials. Prevent start 18 out of 20
- 0.05 Used in clearance rate test
- 0.10 Used in long term calibration stability testing

2013: BAIID alcohol setpoint is 0.02. Tests are performed at 0.000, 0.008, and 0.0032 BrAC over various environmental conditions.

- 0.000 20 trials. Permit start 20 out of 20
- 0.008 20 trials. Permit start 19 out of 20 (95%)
- 0.032 20 trials. Prevent start 19 out of 20

2) Breath Sample Volume & Flow Rate

The new spec actually reduces required sample volume from 1.5 to 1.2 liters – most likely to allow smokers and the elderly to provide a sample. The 1992 spec detailed how 1.5 liters was required to be sure the user was providing alveolar air (deep lung) to make sure the air sample is drawn from a region of the lungs where alcohol vapor is in equilibrium with the blood concentration. See 1992 Section 4.2.

1992: Only requires a sample volume check of 1.5 liters using a spirometer.

2013: Sample volume and flow rate are checked. For each test, 5 checks are performed. All must pass 5 out of 5 times.

- 0.0 BrAC with sample volume of 1.0 liter : Prevent start (low volume)
- 0.0 BrAC with sample volume of 1.5 liter : Permit start
- 0.0 BrAC with sample volume of 1.2 liter at 0.1 L/s : Prevent start
- 0.0 BrAC with sample volume of 1.2 liter at 0.7 L/s : Permit start

3) Calibration and Stability

The new spec actually reduces the time over which calibration stability is tested.

1992: Complete testing required approximately 30 days. Calibration stability added another 67 days. An extensive check.

The 1992 1.3.T Calibration Stability Test requires 10 samples/day over 5 days a work week for 60 days plus the 7 day return for service period. This is 10 weeks (60 + 7 = 67 days). For 9 days, 10 samples are provided with no alcohol. On the 10th day, 10 samples of 0.10 BrAC is provided. This is repeated so at least 50 of the sample over the 67 days are conducted with this high concentration alcohol. At the end of this, calibration accuracy at the low end is checked again.

2013: Calibration stability check under 2013 is to check 0.00, 0.008, and 0.032 BrAC on day 1 and on day 37, day 67. The testing has been significantly reduced and probably lessens the ability to prove accuracy. 1992 specs called for 670 samples to be provided over 67 days to prove stability. At least 50 of these were at high 0.10 BrAC.

Note: Tests under 2013 are performed 3 minutes apart, but the specific 1992 "2.2.T Clearance Test" at high alcohol (0.05) is not required.

4) Input Power

Adds a low voltage test. Proves BAIID can warm and operate at a low voltage.

1992: Testing performed at 11 VDC and 16 VDC.

2013: Most tests are performed at 11 and 16 VDC. Adds alcohol measurement and warm-up testing at 9 VDC.

Note: Battery voltage is reduced by about 15% at -40C, but the AH capacity is reduced over 50%. The 9 VDC test in -40C conditions is probably too tough. A 9 VDC battery at -40C will probably not start a vehicle. A better test would be a cold-crank test to verify the BAIID can operate properly during engine starting. At -40C, and at many other times, the vehicle's battery will drop to 5 VDC during starting. Alcohol isn't measured during this time, but a BAIID must survive this condition.

The battery specification of CCA – cold cranking amps is how many amps a battery can produce for 30 seconds at 0 F (-18 C) and not fall below 7.2 VDC.

5) Extreme Temperature & Humidity Tests

Proves BAIID operation in a humid environment.

1992: Tested at +85C, 12 VDC. No Humidity test.

2013: No high temperature testing. Adds 95% humidity testing +49C at 16 VDC.

6) Warm Up Times at -40 degrees Celsius

Improvement for users in cold climates. But most experts agree the vehicle most likely won't start with 9 VDC at that temper.

1992: 5 minute warm-up time required at -20C (4 hr soak) with 12 VDC input power

2013: 3 minute warm-up time required at -40C (1 hr soak) with 9 VDC input power

7) Vibration

May improve reliability in the automotive environment.

1992: Specified a vibration test.

2013: Specifies a more complex vibration test based on automotive testing regimens.

8) Re-test Intervals

New spec is a slightly tighter high limit and adds a low limit for the rolling retest. This is just another check of (1) Precision & Accuracy.

1992: Rolling Retest is checked at 0.04

2013: Rolling Retest checks that after starting with 0.00, a rolling retests are prompted. 5 samples tests each above and below the setpoint must allow/lockout operation properly:

- 5 samples of 0.008 must allow continued operation
- 5 samples of 0.032 must treat as a failed test and indicate the need for a service call.

Note: 2013 adds an odd requirement:

"A failed (rolling) retest must be identified as an alert condition and flagged on the interlock data logger. A missed retest must be flagged on the interlock data logger. After the driver is alerted to retest, if the engine is accidentally or intentionally powered off, the BAIID must not allow the vehicle to start without a service call."

This requirement will strand drivers for not providing a rolling retest. They provided a sample to start, but missed the rolling retest. This is a severe requirement. There is no similar requirement for something more serious – like providing a positive alcohol sample.

9) Tampering and Circumvention

New spec has a slightly tighter alcohol limit. Half of the checks are performed, but all must perform properly. Checks for Hot Wiring / Push Starting / Un-warmed air sample / Warmed Air Sample / Cooled Positive Sample / Filtered Positive Sample

1992: Positive alcohol tests are checked at 0.04. Passing for each test is 80%. 8 of 10 checks must pass.

2013: Positive alcohol tests are checked at 0.32. 5 tests of each type are performed. All must perform properly to pass.

10) Restarts of Stalled Motor Vehicles

An extra minute is allowed to restart a stalled vehicle.

1992: A 2 minute restart is specified

2013: A 3 minute restart is specified

11) High Altitude Operations

Proves the BAIID can operate in high and low elevations

1992: Manufacturers were required to provide notice to users if device was not able to maintain accuracy up to 2.5 km

2013: Test at 6400 ft (2 km) and -2200 ft (-0.67 km) but is lower than anywhere on dry land

12) Cigarette Smoke

Proves the BAIID is not impacted by cigarette smoke.

1992: Optional smoke test.

2013: Requires cigarette smoke be blown into the unit.

13) Acetone

Proves the BAIID is not impacted by acetone.

1992: N/A.

2013: Acetone is added to the test solution and the device must operate properly.

14) Radiofrequency Interference

No improvement for users or accuracy. Proves the BAIID is a good citizen in an automotive environment.

1992: Acknowledged that full RFI characterization was beyond scope of the specification. Testing required a CB radio or cell phone be keyed on in proximity and erroneous operation noted.

2013: Implement a full battery SAE J1113 and CISPR 25 Series of testing. Basically enforces automotive production requirements. Much of this makes sure the BAIID does not impact other vehicle electronics. None of these tests improve breath alcohol measurement.

- A. J1113-1 2006-10 General and definitions. Electromagnetic Compatibility
- B. J1113-2 2004-07 Conducted immunity 30 Hz to 250 kHz- Power leads.
- C. J1113-4 2004-08 Conducted immunity - Bulk Current Injection (BCI) Method.
- D. J1113-11 2007-06 Immunity to Conducted Transients on Power Leads
- E. J1113-13 2004-11 Part 13: Immunity to Electrostatic Discharge
- F. J1113-21 2005-10 Immunity to Electromagnetic Fields, 30 MHz to 18 GHz.
- G. J1113-22 2003-11 Immunity to magnetic fields
- H. IEC CISPR 25 Limits of Radio Disturbance.

In summary, it might be possible to say that the changes from 1992 to 2013 has improved basic device consistency and accuracy in the operation or use of BAIIDs. The specifications have been tightened in some respects and loosened in others. A claim that these changes might reduce false positive readings is probably not possible.

As explained in the 2010 NHTSA notice, "accuracy" is the degree to which a BAIID measures the BrAC correctly. For example, for a BAIID to be accurate, a breath sample with no alcohol present (0.000 g/dL) must not prevent the vehicle from starting. "Precision" is the degree to which that same measure can be repeated. In the previous example, for the BAIID to be precise, that same alcohol free breath sample should not prevent the vehicle from starting consistently over time. (75 Fed. Reg. 61822.)

Precision and accuracy have been improved to some extent in the 2013 spec, but some important testing has been removed and other limits relaxed. See sections:

- 1) Precision and Accuracy
- 2) Breath Sample Volume & Flow Rate
- 3) Calibration and Stability

The 2013 spec proves operation the device under several new automotive and environmental conditions that may rarely occur. These do not impact user operation or improve accuracy of the device. See sections:

- 4) Input Power
- 5) Extreme Temperature & Humidity Tests
- 6) Warm Up Times at -40 degrees Celsius
- 7) Vibration
- 11) High Altitude Operations
- 12) Cigarette Smoke
- 13) Acetone
- 14) Radiofrequency Interference

The 2013 spec makes some small changes related to user operation but do not improve accuracy of the device.

- 8) Re-test Intervals
- 9) Tampering and Circumvention
- 10) Restarts of Stalled Motor Vehicles